

Appl. No. 10/840,095
Amdt. dated 01/13/2007
Response to Office Action of 10/17/2006

Attorney Docket No.: N1085-00288
[TSMC2004-0032]

REMARKS/ARGUMENTS

Claims 1-23 are currently pending in this application. Claims 1-23 were rejected in the subject Office Action. Claims 1, 2, 4, 6, 7 and 18 are hereby amended and claims 3 and 20 cancelled. Applicants respectfully request re-examination, reconsideration and allowance of each of pending claims 1, 2, 4-19 and 21-23.

I. Claim Rejections – 35 U.S.C. § 102

Claims 1-2, 12-14, 17-18 were rejected under 35 U.S.C. § 102(b) as being anticipated by Zheng, et al. (U.S. Patent No. 6,746,591), hereinafter "Zheng." Applicants respectfully submit that these claim rejections are overcome for reasons set forth below.

Each of independent claims 1 and 18 now recites the feature that a third biasing step which follows the low-power second biasing step, includes a greater current density than the first current density of a first biasing step. Zheng does not disclose this feature and the Office Action does not allege that Zheng discloses or suggests this feature. Claims 1 and 18 are therefore distinguished from Zheng. Claim 2 has been amended, and claims 2, 12-14 and 17 depend from claim 1 and are therefore similarly distinguished from Zheng.

As such, the rejection of claims 1-2, 12-14 and 17-18 under 35 U.S.C. § 102(b) as being anticipated by Zheng, should be withdrawn.

II. Claim Rejections – 35 U.S.C. § 103

Claims 3-11, 15-16 and 19-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Zheng as applied to claims 1-2, 12-14 and 17-18 in view of a person of ordinary skill in the art. Applicants respectfully submit that these claim rejections are overcome for reasons set forth below.

The features of previously-pending claim 3 have been added by way of amendment, to independent claim 1, and the features of previously-pending claim 20

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have been added by way of amendment to independent claim 18. Independent claims 1, 18 and 21 are believed distinguished from Zheng in view of a person of ordinary skill in the art for the following reasons.

Each of independent claims 1, 18 and 21 recites the feature of a continuous electroplating operation with first, second and third steps including first, second and third current densities, respectively. The second current density is greater than zero and less than the first current density and the third current density is greater than the first current density.

Zheng does not disclose this feature. Zheng is absolutely limited to an alternating series of high/low current density steps in which each of the low current density steps has the same current density and in which each of the high current density steps has the same current density.

It is **because** of this non-obvious combination of features that the invention provides the advantages of A] superior step coverage, completely filled openings (i.e. void-free structures) such as via openings, and no pull-back, in combination with B] an overall high deposition rate. The initial critical steps including the low current density second step, ensures that the electrodeposition provides superior step coverage, void-free structures and no pull-back. The overall high deposition rate is achieved by a succession of high current density steps that follow the low current density immersion (second) step such as "the third" step as in claims 1, 18 and 21. Claim 21 further points out that this third step is part of "subsequent steps of continuously increasing current densities beginning with a third step."

It is this combination of claimed limitations that are non-obvious under the conditions of 35 U.S.C. § 103, even though some of the limitations may be separately known. Applicants submit that a holding that combination claims are invalid based merely upon finding similar elements in separate prior art would be contrary to statute and would defeat the congressional purpose in enacting title 35. *Smithkline*

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5 *Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 8 USPQ2d 1468 (Fed. Cir. 1988). The hindsight reasoning employed in using the invention as a roadmap to find its prior art components, would discount the value of combining various existing features or principles in a new way to achieve a new result – often the very definition of invention. Applicants respectfully submit that the Examiner has not shown some suggestion or motivation, before the invention itself, to make the claimed combination as required in *Ruiz v. AB Chance Co.*, 357 F.3d 1270, 69 USPQ2d 1686, 1690 (Fed. Cir. 2004).

10 It is respectfully submitted that independent claims 1, 18 and 21 are patentable, because there is no apparent suggestion or motivation to combine the aforementioned reference with the features alleged to be known to one of ordinary skill in the art, to solve the problem addressed by the Applicants at the time of the Applicants' invention: in order to eliminate pull-back, void formation or poor step coverage, an unacceptably slow deposition rate was required. Due to the combination of claimed features recited
15 in independent claims 1, 18 and 21, the invention offers the advantage of outstanding step coverage, void-free filled structures and a faster deposition rate than Zheng which only uses a high voltage bulk deposition step half of the time as evidenced by Fig. 5 of Zheng and as described in col. 8, l. 45-48 of the specification, which provides: "The pulsed or modulated bias, which may be pulsed in a square wave, saw tooth wave,
20 sinusoidal wave, other waveforms having generally oscillatory type characteristics, or variations thereof, . . ." Conversely, in the admitted prior art, a deposition sequence of increasing magnitudes is provided but does not provide the advantage of void-free deposition, superior step coverage and no pull-back.

25 Based on the foregoing, Applicants respectfully submit that it would not be obvious to combine the aforementioned features. Applicants further submit that the Examiner has not provided any evidence, other than using the claimed invention and hindsight, showing why one of ordinary skill would be motivated to combine the references to produce a process sequence with a single low current density deposition

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step that solves the problem addressed by Zheng but does so without sacrificing deposition rate and time. Again, Zheng requires generally oscillatory wave forms in which half the time is spent at a low bias and low current density.

Applicants therefore submit that the combination of features recited in claims 1, 5, 18 and 21 are not obvious in view of Zheng and one of ordinary skill. Claims 3 and 20 have been cancelled. For the foregoing reasons, the rejection of claims 4-11, 15-16, 19 and 21-23 under 35 U.S.C. § 103(a), should be withdrawn.

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CONCLUSION

Based on the foregoing, each of pending claims 1, 4-19 and 20-23 is in allowable form and the application in condition for allowance, which action is respectfully and expeditiously requested.

5 The Assistant Commissioner for Patents is hereby authorized to charge any fees or credit any excess payment that may be associated with this communication to Deposit Account 04-1679.

Respectfully submitted,

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